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THE PSYCHOLOGICAL REALITY OF THE PARAGRAPH.

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REPORT NUMBER BR-6-1784 PUB DATE 67
CONTRACT OEC-3-6-061784-0508
EDRS PRICE MF-$0.25 HC-$0.60 13P.

DESCRIPTORS- #PSYCHOLINGUISTICS, #PARAGRAPH COMPOSITION, MORPHOLOGY (LANGUAGES), #ENGLISH, WRITTEN LANGUAGE, DISCOURSE ANALYSIS,

FOUR PASSAGES OF EXPOSITORY PROSE WERE ANALYZED IN TERMS OF EXTRA-SENTENCE STRUCTURES IN THREE SYSTEMS--LEXICAL, GRAMMATICAL, AND RHETORICAL. NONSENSE WORDS WERE SUBSTITUTED FOR ALL CONTENT WORDS IN EACH PASSAGE, GRAMMATICAL ENDINGS ON WORDS WERE RETAINED, AND PARAGRAPH INDENTIONS WERE REMOVED. FORTY-EIGHT COLLEGE UNDERGRADUATES WERE INSTRUCTED TO PLACE PARAGRAPH MARKERS AT "APPROPRIATE SENTENCE JUNCTURES" IN BOTH ENGLISH AND NONSENSE PASSAGES. SUBJECTS SHOWED A HIGH DEGREE OF AGREEMENT IN PLACING PARAGRAPH MARKERS IN BOTH ENGLISH AND NONSENSE PASSAGES. THE CORRELATION BETWEEN THE INCIDENCE OF PARAGRAPHING AT SPECIFIC SENTENCE JUNCTURES WAS .82 BETWEEN ENGLISH AND NONSENSE VERSIONS. THE INCIDENCE OF PARAGRAPHING WAS STRONGLY RELATED TO THE NUMBER OF SYSTEMS IN WHICH STRUCTURAL DISCONTINUITIES OCCURRED. THE RESULTS WERE DISCUSSED IN TERMS OF THE NATURE OF THE CUES WHICH APPEAR TO BE OPERATIVE, THE NATURE OF PARAGRAPHING ABILITY, AND IMPLICATIONS FOR THE TEACHING OF PROSE WRITING. THIS ARTICLE APPEARED IN "STUDIES IN LANGUAGE AND LANGUAGE BEHAVIOR, PROGRESS REPORT NO. IV" OF THE CENTER FOR RESEARCH ON LANGUAGE AND LANGUAGE BEHAVIOR, UNIVERSITY OF MICHIGAN, CITY CENTER BUILDING, 220 EAST HURON STREET, ANN ARBOR, MICHIGAN 48108. (AUTHOR/JD)

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The Psychological Reality of the Paragraph

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Four passages of expository prose were analyzed in terms of extra-sentence structures in three "systems", i.e., lexical, grammatical, and rhetorical. Nonsense words were substituted for all content words in each passage, grammatical endings on words were retained, and paragraph indentions were removed. Forty-eight college undergraduates were instructed to place paragraph markers at "appropriate sentence junctures" in both English and nonsense passages. Subjects showed a high degree of agreement in placing paragraph markers in both English and nonsense passages; the correlation between the incidence of paragraphing at specific sentence junctures was .82 between English and nonsense versions; the incidence of paragraphing was strongly related to the number of systems in which structural discontinuities occurred. The results were discussed in terms of the nature of the cues which appear to be operative, the nature of paragraphing ability, and implications for the teaching of prose writing.

There is currently an increasing overlap between the concerns of the linguist and of the psychologist who studies language behavior. In recent psychological literature, several experiments have dealt with various aspects of supra-word linguistic structure, such as the psychological reality of linguistic segments (Fodor and Bever, 1965), and of phrase structure rules (Johnson, 1965). In each case, however, the sentence has been implicitly accepted as the most appropriate maximal structural unit for study, while the problems of paragraph structure and of paragraphing behavior have been largely ignored.

Becker (1965, 1966) has recently begun development of a theory of paragraph structure which invites empirical confirmation in the laboratory. Basing his approach on the tagmemic model first proposed by Pike (1954, 1955, 1960), he suggests that the full explication of paragraphs must be carried out concurrently along several dimensions. To date, his analysis has lead to the postulation of three interlocking, simultaneously-operating "systems" in written material, which he has labeled lexical, grammatical and rhetorical. In addition, a fourth (phonological) system is expected to operate in spoken language. Furthermore, he has explicitly rejected the sentence as a <u>necessarily</u> relevant or important unit in the paragraph.

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The lexical system consists of overlapping "lexical equivalence chains", which may, and often do extend over several sentences. A chain is usually a group of sentences, all of which make statements dealing with the same content domain. In doing so, "equivalence" is maintained by the use of synonymity, metaphor, paraphrasing, and relative and personal pronouns. For example in the following pair of sentences: "John left the office early, complaining of a severe headache. I hope he will feel better tomorrow."John and he are links in an equivalence chain.

The grammatical system consists of patterns of formal markers, such as the singularity or plurality of subjects and predicates, the tenses of verbs, and the presence and kind of modal auxiliaries. These elements, depending heavily on word endings as signaling devices, often extend beyond the single sentence.

The rhetorical system consists of a sequence of functional slots, each of which may be filled by one or more sentences. Two patterns of slots that seem to appear often in expository prose are those designated T(topic)-- R (restriction)--I(illustration), and P(problem)--S(solution). In a sense, they are the formal elements, the result of whose interaction is the paragraph, in much the same way that relationships between subject, verb, and object specify the sentence. Formal markers include cue words and phrases, such as for example, in other words, furthermore, however, then, but, and finally. The semantic markers of the lexical equivalence chains also often supply corroborative information indicating the beginning and end of rhetorical structures.

In this experiment, the term "structural element" designates a string of sentences (not necessarily consecutive) which share a common marker, such as having a given verb tense (grammatical system), or sentence subject (lexical system), or extending between rhetorical transition words (rhetorical system). Within and between the three systems, the structural elements can, and often do, vary quite independently of each other. A sentence juncture at which any element begins or ends is here termed a "structural break", regardless of the system in which it occurs.

The theory seeks to explicate the ability of native English speakers to discriminate the structural cues (a significant portion of which are postulated to be formal in nature) which identify paragraphs. If this is to be done, the functional reality of the systems, and of the structural elements and their junctures, must be established. One way of approaching the problem is to perform theoretical analyses of several passages of English prose, specifying the domains of all structural elements and the systems with which they are associated. Then paragraph indentions can be removed, and naive (as regards the theory) English speakers can be instructed to place "¶" at those sentence junctures where they seem "appropriate". Under these conditions, the theory gives rise to four predictions.

1. If paragraphs are conventional but not arbitrary units, Ss should agree with each other in placing paragraph markers, i.e., the distribution of "¶" responses in the passages will be multi-modal and will differ markedly from a chance (rectangular) distribution.

2. If a significant proportion of paragraphing cues are formal in nature, paragraph markers should tend to cluster at the same sentence junctures, regardless of whether the passages are normal English discourse or derived nonsense passages in which nouns, verbs, adjectives, and adverbs have been replaced by nonsense words of equal syllabic length. That is, there will be a significant and positive correlation between English and derived nonsense passages in the proportions of Ss placing "¶" at the same sentence junctures.

3. Paragraphing behavior at sentence junctures should co-vary with the number of systems in which structural breaks occur at those junctures. However, since there appears to be a considerable area of individual decision in paragraphing, it would not seem to be necessary to account for all such choices, since a small proportion of them can easily be associated with chance vagaries and fluctuations of experimental "set". Therefore, as a first approximation, a sufficiently rigorous test of the model would be an evaluation of its performance at those sentence junctures where the probability of paragraphing was at least 20 per cent. That is, there will be a significant overlap between the distribution of sentence junctures at which 20 per cent or more of the Ss mark "¶", and the distribution of junctures in which three-system breaks occur. Furthermore, this overlap will be proportionally greater than that with junctures which have breaks in only two of the systems.

4. Assuming that the effects of structural breaks in all three systems are equal and additive, the greater the number of such breaks that occur at a given sentence juncture, the greater should be the proportion of Ss who place paragraph markers at that juncture. More specifically, there will be a significant and positive correlation between the total number of structural breaks at sentence junctures and the percentage of Ss placing paragraph markers at those junctures.

Method

Materials. Four expository passages of English prose were chosen by two of the Es as representative of as many different paragraph structures. All passages began and ended with a paragraph (per the original author). For the nonsense passages, all nouns, verbs, adjectives, and adverbs were replaced with nonsense words (paralogs) of equal syllabic length. For example, the sentence "Sloths have no right to be living on the earth today; they would be fitting inhabitants of Mars, where a year is over six hundred days long" becomes "Smars have no mirt to be lewling on the kust reteb; they would be tibbing nonentants of Ness, where a reet is over nus cantron tels dan." The number of sentences per passage varied from 16 to 28; the number of words from 405 to 592. Word endings that play a grammatical role were retained (e.g., -ed, -ly, -s, ing), and all paragraph indentions were removed. Two or three sentences were added to the beginning and end of two of the passages, and data were collected using both the "regular" and "extended" versions. Each passage was printed on a separate page; the lines in which sentence junctures occurred were numbered in the left-hand margin. In the nonsense version, a given paralog replaced one and only one English word, and was repeated at every occurrence of the latter.

Subjects. The Ss were 48 college undergraduates; approximately 50 per cent of them were male, although the sex of the Ss was disregarded in data collection and analysis. One-half served as part of a class requirement; one-half were paid volunteers.

Procedure. Each S responded to one English and to one nonsense passage (which was derived from a different English passage); one-half paragraphed a nonsense passage first, one-half an English passage first. Passages were randomly assigned to Ss; the number of Ss responding to each passage ranged from 11 to 13. The data were collected in four group sessions, with the number in each group ranging from 6 to 25.

The experimental session was conducted as a series of tasks, with each S working at his own pace, and with successive tasks given him only upon completion of the preceding one. The Ss were given an English (or nonsense) passage and a page of printed instructions which: explained the purpose of the experiment ("to find out how and why we use paragraphs"); asked him to read the passage carefully and to place paragraph markers "at the places that seem right to you", without regard to where the author may have put them; pointed out that there were other tasks to be performed; and requested that he raise his hand when he finished the current one. The instructions were also read aloud, and questions answered. When the S completed the first passage, he was given the second, with an additional instruction page, which explained that he was to perform the same task on different material.

Upon completion of paragraphing the second passage, the S was given a list of seven paragraphing "cues", plus one open category, and an instruction sheet asking him to designate the one or more cues to which he was responding when he placed each "¶" in the two passages, and to write in additional cues wherever he thought they were operative. The cues supplied were: change of subject, change of time, change of location, change of verb, beginning or end of question-answer pattern, beginning or end of topic-illustration pattern, and transition word.

In addition, one-half of the Ss were asked to paragraph an English and a nonsense "extended" passage. In this case, instructions specifically stated that "the passage may or may not begin with a paragraph". When the S had completed all tasks, he was dismissed.

One of the Es (AB) used his theory as a basis for analyzing the four passages and specifying the domains of the structural elements in each of the three systems independently. This analysis supplied an estimate of the number and kind of theoretical "structural breaks" at each sentence juncture. Both the beginnings and the ends of such elements were considered as breaks in the statistical analysis.

Results

It was possible that the order of presentation of the stimuli (i.e., English-nonsense vs. nonsense-English) could produce differences in paragraphing responses. Chi-square was used to compare the distributions of paragraph markers, and of total number of markers associated with the two

orders; there were no significant differences. Therefore, all data were pooled for further statistical analysis. An a priori decision was made to consider the placing of a "¶" by 20 per cent or more of the Ss as defining "significant" paragraphing behavior, and to attribute fewer than that proportion to random variability.

It can be seen in Table 1 that the distribution of paragraphing

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Insert Table 1 about here

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responses for each passage consists of many sentence junctures at which fewer than 20 per cent of the Ss indicated paragraph boundaries, and a few at which substantial amounts of paragraphing occurred. It is interesting to note that the top four categories of the table account for 86 per cent of all paragraph markers placed in all English and nonsense versions combined, despite the fact that they represent fewer than 30 per cent of the total number of sentence junctures. The distributions, though this cannot be discerned from the table, are indeed multi-modal, with the number of modes varying from three to five per passage. It is apparent that Ss agree with each other in their judgments of paragraph boundaries--in both English and nonsense passages. Paragraphing, then, is a reliable phenomenon and the first prediction is supported.

Prediction two stated that if Ss are responding to formal, as well as semantic, cues in paragraphing, there should be a significant correlation between the English and nonsense passages in the proportions of Ss placing "¶" at given sentence junctures, since semantic cues are severely curtailed in the nonsense passages. This prediction was supported by a Pearson r of .82 across all four pairs of English and nonsense passages. This result tempts one to stress the importance of formal cues even more heavily than the theory suggests, especially when further analysis shows that the lexical system was by far the least accurate of the three individual systems in predicting paragraphing by 20 per cent or more of the Ss.

The third prediction was based on the theoretical assertion that paragraph structure can best be explicated in terms of all three systems. This means that the presence at sentence junctures of structural breaks in three systems should more accurately predict "significant" paragraphing than breaks in any smaller number of systems. Figure 1 shows that this is indeed the case.

Insert Fig. 1 about here

Of 20 junctures in the English passages with three-system breaks, 13 of them also exhibit paragraphing by 20 per cent or more of the Ss. A comparison of this number with the (approximately) five that would be expected if junctures with three system breaks were evenly distributed among all 77 junctures, yields $\chi^2 = 12.80$ (df = 1, $p < .001$, 2 tails). It can be seen in Fig. 1 that distribution overlaps for two-system breaks are proportionally smaller, due mainly to increasing number of false positives. It should be mentioned, however, that a chi-square test of the overlap between the 20 per cent "¶" distribution, and the "rhetorical-grammatical" break distribution was significant beyond the .01 level ($\chi^2 = 9.83$, df = 1,2 tails). All other overlaps were not significant.

Insert Table 2 about here

Table 2 presents the same information in a different form for both English and nonsense passages. Here the statistic used is "per cent overlap between 'significant' degrees of paragraphing behavior and the number of systems in which 'breaks' occur."

It can be seen that the accuracy is greatest (82 per cent for English) with three-system breaks and decreases as the number of system-breaks declines. The Pearson r between system-breaks and number of paragraph markers was .46 for English and .41 for nonsense passages.

The fourth prediction concerned the relation between the total number of structural breaks occurring at a sentence juncture and the proportion of Ss placing paragraph markers at that juncture. The Pearson r between the two is .54 for English, and .45 for nonsense passages. Both of these, of course, are statistically significant with 76 df, and the prediction is supported, but a large amount of variance is not yet accounted for.

It will be recalled that two passages were extended by adding several sentences that were, in the original work, contiguous with the experimental passage used but were placed in preceding or succeeding paragraphs by the author. The question was whether Ss would succeed in identifying the beginnings and ends of full paragraph structures, and would recognize less related "dangling" sentences. The results indicate that they did. In the two English passages, the proportion of Ss placing "¶" at the sentence

juncture beginning the first full paragraph (per the original author) were 56 per cent and 71 per cent; the end of the last paragraph was indicated by 78 per cent and 28 per cent paragraph markers by Ss.

Of the seven paragraphing cues supplied Ss, "Beginning or end of topic-illustration pattern" was most often given for paragraphing (38 per cent of the total number of reasons for English passages; 30 per cent for nonsense). "Change of subject" was second most popular, accounting for 29 per cent of the reasons given for paragraphing English passages, and 23 per cent for nonsense.

Discussion

The Ss in the experiment read and studied the entire passage before making their paragraph judgments; there were very few cases in which a paragraph marker was placed on the first traversal of the material. Post-experimental interviews disclosed that the Ss were "searching for patterns", and their substantial agreement with each other indicates that they must have found very much the same patterns. Paragraphs, then, appear to be conventional entities, but they do not represent arbitrary whims on the part of their authors.

It appears that formal, rather than semantic, cues are dominant--at least in the task of recognizing paragraph structure. This conclusion is supported by three kinds of evidence. First, the high positive correlation between English and nonsense versions cannot be accounted for in terms of thematic or associative relations between content words. Second, the least accurate predictions of paragraphing were associated with the lexical system, either alone or paired with other systems. Both rhetorical and grammatical systems were more accurate in both English and nonsense versions. Third, multiple correlations with the number of structural breaks in each of the three systems as independent variables and percent paragraphing as the dependent variable consistently showed the lowest beta weights attached to the lexical breaks. In a way this is a surprising finding because, if we are to consider the paragraph a semantic unit, we must take account of the formal structural markers of the rhetorical and grammatical systems. They apparently play functional roles in relating the meaningful elements within the paragraph to each other, in a rough analogy to the grammatical structure of sentences.

It was originally expected that the numbers of structural elements which continued without interruption across sentence junctures would show a negative correlation with paragraphing, just as the number of breaks was positively related. However, although structural breaks and these structural "continuants" were negatively correlated (Pearson $r = -.66$) the latter showed only a weak relation to paragraphing. A low incidence of paragraphing, then, is related to the absence of structural breaks, but not to any concentration of continuing elements. One may speculate that this is another instance of the familiar psychological phenomenon of greater sensitivity to changes in stimulation than to steady states.

The current experiment represents only the first step in a continuing investigation. Future studies will involve removing specific markers associated with each of the systems and testing for subsequent changes in paragraphing behavior by Ss. A second area of study will call for Ss to indicate paragraph junctures in orally presented material in order to explore the cues and structure of the phonological system. A third problem area is that of cross-linguistic comparison of paragraph structures and cues; a fourth, developmental changes in paragraphing ability.

The results of this experiment carry implications for the classroom teaching of writing in both first and second languages. The identification of at least some of the cues which are associated with the recognition of paragraph structure should lead to the development in students of greater control and precision in their own paragraphing. Previously vague rhetorical notions of paragraph "unity" and "coherence" may now be functionally defined in terms of the domains and structural breaks of the several systems. Unity may, for example, be interpreted as a significant absence of breaks in one or more systems. Furthermore, comparisons of paragraph systems in different languages may reveal previously unspecified problems in language pedagogy. For example, English requires the use of tense markers; continuity in tense may well be an important structural cue in paragraphing. On the other hand, in languages like Thai and Burmese tense markers are not obligatory, but English-speaking students of these languages tend to use tense markers as a structural device in producing discourse in those languages. In doing so, they fail to exploit the proper systems for marking sequence, with a resultant stilted effect.

It is possible that paragraphs represent our capacity to "chunk" information for greater ease of storage and subsequent use. To date, the recall of continuous discourse cast in paragraph form has been shown to be influenced by such things as internal determinants expressed in "selective" memory (Bartlett, 1932; Levine & Murphy, 1943) and of more public variables such as the degree of associative connections between content words (Rosenberg, 1966). It appears that the structure of the paragraph may well be another parameter relevant to understanding and recall. After some of the more important paragraphing cues have been more precisely identified, it may be possible to affect the accuracy of recall of paragraphs, for example, by systematically manipulating these cues.

What is the nature of paragraphing ability? It appears to be a phenomenon somewhat different from the kind of competence usually associated with the generation or recognition of sentences. The argument that a speaker can and will recognize and correct his "errors" in performance is often used to support the generative grammarians' distinction between competence and performance. The implication is that everyone will recognize the same "errors" and will correct them in substantially the same way (though this has not been unambiguously demonstrated). It would appear that the Ss' responses in this experiment represent, in large measure, their competence, since there was no imposed time limit and they were invited to rely on their own knowledge of linguistic structures in making their decisions. Under these conditions there seems to be very little "error" in paragraphing (as the term is used with regard to sentence generation)--"disagreement" seems to be a better term for what happens. However, these disagreements are usually quite readily resolved. Ss who have placed paragraph markers at different points in a passage can often give reasons for their decisions which are mutually acceptable, "if one chooses to look at it in that way". One explanation that suggests itself is the multisystemic nature of paragraphs which lends itself to differential weighting of the systems by different speakers. Inducing a set to concentrate on any one system may well result in greater conformity of response than was found here.

At any rate, paragraphing rules seem to be more flexible than are those associated with the generation of sentences. Perhaps there are sets of rules, and users of a language shift from one set to another in response to cues which have not yet been identified, but which may well extend beyond the paragraph.

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Figure Caption

Fig. 1. Relation between sentence junctures in English passages at which $\geq$ 20 per cent, and < 20 per cent, of Ss marked "¶" and structural breaks in rhetorical, grammatical, and lexical systems.

Table 1

Number of Sentence Junctures at Which Each of Five Levels of Paragraphing Occurred

Percent Subjects marking "¶"	Passage 1		2		3		4	
	Eng.	Non.	Eng.	Non.	Eng.	Non.	Eng.	Non.
80-100	1	0	3	0	1	0	0	0
60-80	2	0	0	1	2	3	1	1
40-60	2	5	0	4	1	1	2	4
20-40	0	1	0	2	0	2	5	1
0-20	9	8	24	20	15	13	9	11
Total number of junctures	14		27		19		17	

Table 2

Percent Overlap Between Paragraphing Behavior and Number of Systems in Which Structural Breaks Occur

Systems in which structural breaks occur	Passages	
	English	Nonsense
Three systems	82	75
Rhetorical and grammatical systems	79	71
Rhetorical and lexical systems	75	70
Grammatical and lexical systems	60	64
Rhetorical system	70	66
Grammatical system	55	57
Lexical system	35	48

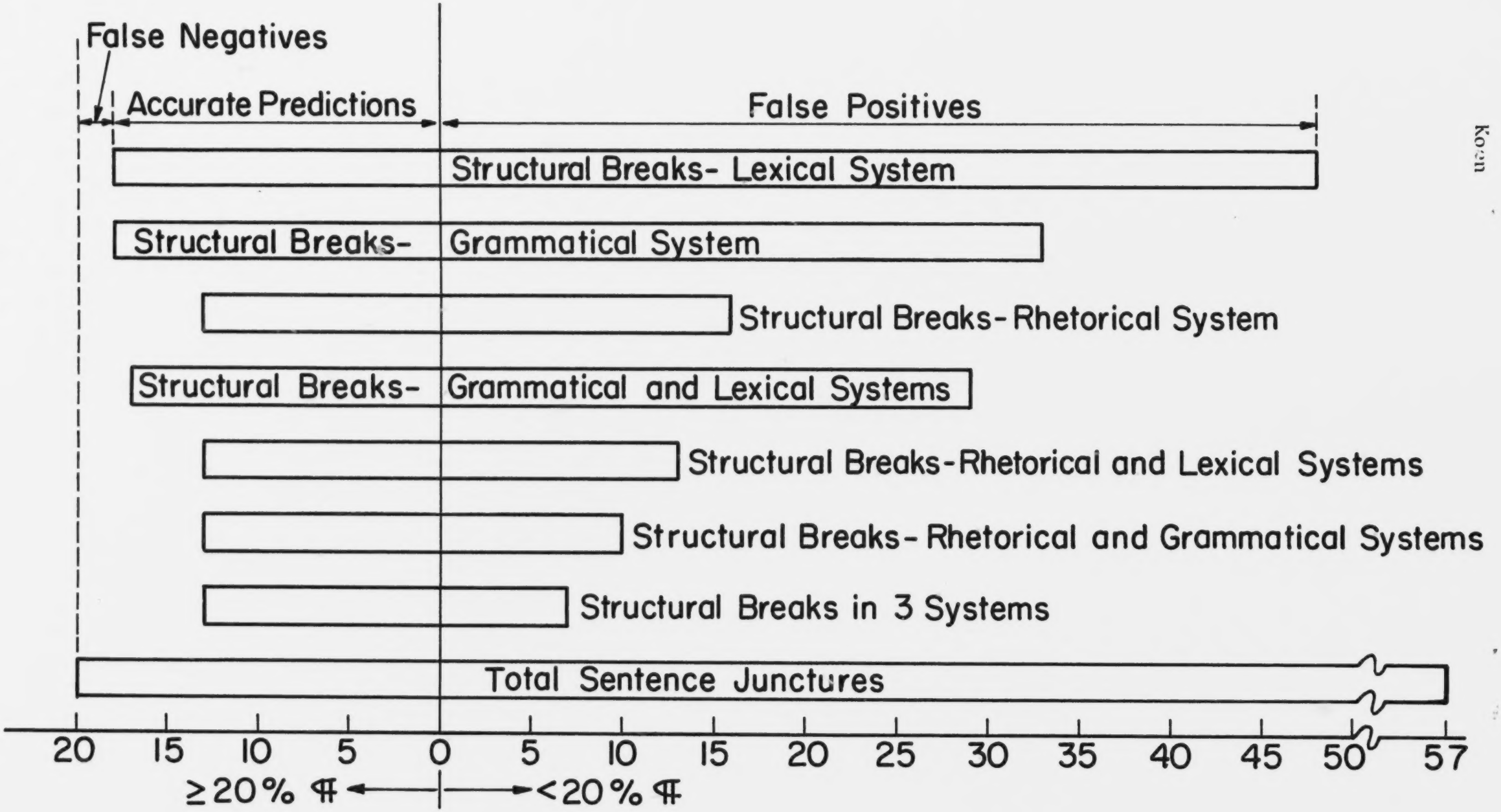
False Negatives
Accurate Predictions
False Positives
Structural Breaks- Lexical System
Structural Breaks- Grammatical System
Structural Breaks- Rhetorical System
Structural Breaks- Grammatical and Lexical Systems
Structural Breaks- Rhetorical and Lexical Systems
Structural Breaks- Rhetorical and Grammatical Systems
Structural Breaks in 3 Systems
Total Sentence Junctures
20 15 10 5 0 5 10 15 20 25 30 35 40 45 50 57
≥20% ¶
<20% ¶
NUMBER OF SENTENCE JUNCTURES

Fig. 1